

CHROMOSOME NUMBERS OF SCIRPUS PURSHIANUS AND S. SMITHII

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Two eastern North American aquatic bulrushes, *Scirpus purshianus* Fern. and *S. smithii* Gray, superficially resemble one another and have been confused in taxonomic literature. Beetle (1942) stated that, "Apparently *S. smithii* is no more than an aquatic extreme of *S. debilis* [an earlier name applied to plants of *S. purshianus*]," while Fernald (1942) maintained, "... all living botanists who accurately know living plants in the field find them abundantly distinct." Some botanists (Gleason and Cronquist, 1963) have continued to treat these species in accordance with Beetle's statement and others (Seymour, 1969) have conformed with Fernald's statement. The characteristics used by Fernald to delineate *S. purshianus*, *S. smithii*, and their forms are accepted here and the following discussion is in accordance with his treatment of these taxa in Gray's Manual (Fernald, 1950).

Part of the taxonomic confusion with *S. purshianus* and *S. smithii* is probably caused by the similar pattern of infraspecific variation of each species. Each has ecologically differentiated forms characterized morphologically by the presence or absence of well-developed barbed bristles attached to the achenes. *S. smithii*, which often appears to be associated with somewhat alkaline substrates, has three described forms: f. *levisetus* (Fass.) Fern. (having nearly smooth bristles), f. *setosus* (Fern.) Fern. (having well-developed barbed bristles), and f. *smithii* (lacking bristles). *S. purshianus*, which often appears to be associated with more acid substrates, has two forms: f. *purshianus* (having well-developed barbed bristles) and f. *williamsii* (Fern.) Fern. (lacking bristles).

In both *S. purshianus* and *S. smithii*, the presence or absence of barbed bristles appears to be correlated with the stability of the habitat. For example in eastern New York, New Jersey, eastern Pennsylvania, and Delaware, *S. smithii*

f. *smithii* is almost completely restricted to the specialized conditions of fresh inter-tidal zones of the Hudson, Raritan, and Delaware Rivers while in the same area f. *setosus* occurs in and around lakes, ponds, and quagmires (see Long, 1910, for a discussion of these forms in the vicinity of Philadelphia). *S. smithii* f. *levisetus* is common in the estuaries of the Kennebec River in Maine and the St. Lawrence River in Quebec. Although bristles are present in f. *levisetus*, they lack the prominent barb-like teeth characteristic of f. *setosus*. Thus it appears that plants of *S. smithii* which lack barbed bristles are better adapted to the periodic fluctuation in water level characteristic of the estuarine environment than are those which have barbed bristles. A similar pattern emerges for *S. purshianus* f. *purshianus* and f. *williamsii*, although tidal fluctuation in water level is not involved since neither form grows in tidal estuaries. However, f. *williamsii* is frequently found on the sandy shores of lakes in Cass, Kalamazoo, and Van Buren Counties in southwestern Michigan while the more widespread f. *purshianus* is infrequently found in this area. There is (or was) considerable water level fluctuation in these southwestern Michigan lakes from spring to fall, a factor which probably is a barrier to plants adapted to lake shores with more uniform water levels. This may be what excludes f. *purshianus* from many southwestern Michigan lakes since, throughout most of its range, it often grows along lake shores with relatively uniform water levels. Thus the forms of both species having barbed bristles appear better adapted to relatively stable conditions associated with little or moderate water level fluctuation while the forms lacking barbed bristles appear better adapted to relatively unstable conditions associated with substantial water level fluctuation.

Despite the ecological and morphological resemblance between forms of these two species, I have always found that the morphological criteria used by Fernald to distinguish them are reliable. In addition, the chromosome numbers determined for the forms of each species provide evidence

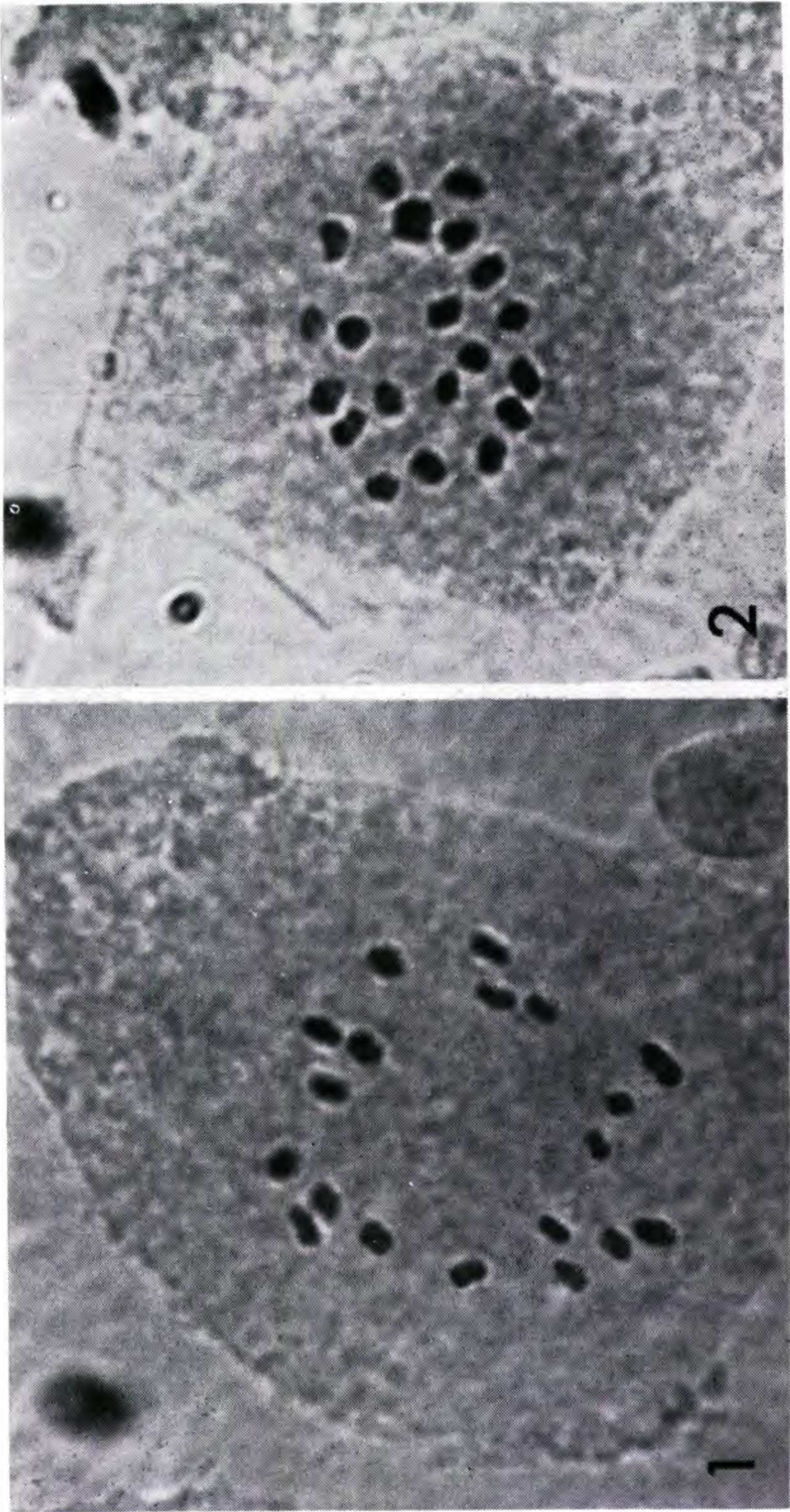


Fig. 1. Meiotic chromosomes of *S. purshianus* (Schuyler 4265).

Fig. 2. Meiotic chromosomes of *S. smithii* (Schuyler 4276).

supporting Fernald's treatment. 19 meiotic units (Fig. 1) were observed in pollen mother cells of *S. purshianus* f. *purshianus* and f. *williamsii* (Table 1). 20 meiotic units, with one unit consistently larger than the rest (Fig. 2), were observed in pollen mother cells of *S. smithii*, f. *levisetus*, f. *setosus*, and f. *smithii* (Table 1). Ordinarily, chromosome numbers are consistent for a given species of *Scirpus* and provide evidence corroborating distinctions among them. The chromosome numbers reported here support the specific recognition of *S. purshianus* and *S. smithii* and indicate that the infraspecific taxa are associated with the proper species in Fernald's treatment.

TABLE 1. Chromosome Numbers Determined for Forms of *Scirpus purshianus* and *S. smithii*

Taxon	Number of Meiotic Units	Voucher Specimens ^a
<i>S. purshianus</i>		
f. <i>purshianus</i>	19	Massachusetts: Barnstable Co., 4265; Pennsylvania: Northampton Co., 3819; Pennsylvania: Berks Co., 4088
<i>S. purshianus</i>		
f. <i>williamsii</i>	19	Michigan: Kalamazoo Co., 3903
<i>S. smithii</i>		
f. <i>levisetus</i>	20	Maine: Sagadahoc Co., 4276
<i>S. smithii</i>		
f. <i>setosus</i>	20	New Jersey: Sussex Co., 4201
<i>S. smithii</i>		
f. <i>smithii</i>	20	New Jersey: Burlington Co., 4203

^aAll are collections by the author preserved at the Academy of Natural Sciences.

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